

DETAILED ACTION

1. This office action is in response to communication filed on July 27, 2010.

Claim Rejections - 35 USC § 112

2. Claims 1, 4-10, and 12-21 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for increasing the predetermined amount of time as the peripheral region distance from the center region of k-space increases, does not reasonably provide enablement for decreasing the predetermined amount of time as the peripheral region distance from the center region of k-space increases. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. The invention is only enabled for an increase of delay time as the immediately prior sampled periphery region to that of a center region is a greater distance from the center since more signal distortion will be created by those image acquisitions from k-space areas further from the center region. Therefore, a longer time delay is required to reach steady state conditions after periphery areas imaged that are further from the center. No other conditions are contemplated or suggested in the disclosure, and other functions than increasing are considered non-working embodiments for the reasons above (i.e. inverse function, decreasing function, constant function).

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 6-10, 12-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With the addition of the limitation in claim 1 of “interleaving sampling of peripheral regions of k-space and samplings of a center region of k-space...”, it remains confusing if the language of claims 6 and 14 sufficiently encompasses the same feature with their respective amended language. For clarity, the language of claim 1 is suggested for all independent claims.

5. Claims 14-20 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are:

Claim 14 is missing the critical component of the center region is sampled at a faster rate than each peripheral region. Applicant admits that the center region must be acquired more frequently as in par. 0010-0012 and fig. 2. Applicant admits that there are multiple peripheral regions and only one center region, that of which is sampled at a faster rate.

Response to Arguments

6. Applicant' arguments have been fully considered. The enablement rejection of claims regarding the zero-encoding feature has been withdrawn in light of the

amendment to the claims. Interleaving the sampling of peripheral region with center region as described in claim 1 is sufficient to overcome the previously identified issues. The language of claims 6 and 14 remain somewhat confusing as to this feature. It has been suggested to incorporate the language of claim 1 into claims 6 and 14.

7. Applicant argues that the feature of claim 3 is not required to enable the parent claim. However, claim 1 currently includes non-working embodiments in its claimed scope which is impermissible in patent claims. The non-working embodiments are a decreasing, inverse, or constant function of delay time versus distance. The working embodiment is an increasing function of delay time versus distance (i.e. if the distance increases, the delay time also increases). I have proposed to incorporate Claim 3 into Claim 1 and other parent claims in the indication of allowable subject matter below.

Allowable Subject Matter

8. Claim 3 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following language is suggested to overcome all issues and expedite allowance:

Claim 1:

A method of MR data acquisition comprising the steps of:

interleaving sampling of peripheral regions of k-space and samplings of a center region of k-space, wherein performing the interleaves sampling comprises:

sampling a first peripheral region of k-space at a pre-selected temporal rate;
waiting a first predetermined period of time before sampling the center region of k-space, the center region being sampled at a faster temporal rate than the first peripheral region;
sampling a second peripheral region of k-space at the pre-selected temporal rate; and

waiting a second predetermined period of time different than the first predetermined period of time before sampling the center region of k-space, the center region being sampled at a faster temporal rate than the second peripheral region;

wherein the first and second predetermined periods of time are a function of a distance of the respective first and second peripheral regions from the center region of k-space, **wherein the predetermined amount of time increases as the peripheral region distance from the center increases.**

Claim 6:

An MRI apparatus comprising:

a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil assembly to acquire MR images; and a computer programmed to:

segment k-space into a center region and a number of peripheral regions;
determine a distance of each peripheral region from the center region; **and**

interleave sampling of the peripheral regions of k-space and samplings of the center region of k-space, wherein performing the interleaves sampling comprises:

sampling a first peripheral region of k-space at a pre-selected temporal rate;

waiting a first predetermined period of time before sampling the center region of k-space, the center region being sampled at a faster temporal rate than the first peripheral region;

sampling a second peripheral region of k-space at the pre-selected temporal rate; and

waiting a second predetermined period of time different than the first predetermined period of time before sampling the center region of k-space, the center region being sampled at a faster temporal rate than the second peripheral region;

wherein the first and second predetermined periods of time are a function of a distance of the respective first and second peripheral regions from the center region of k-space, wherein the predetermined amount of time increases as the peripheral region distance from the center increases.

Claim 14:

A **nontransitory** computer readable storage medium having stored thereon a computer program to reduce image intensity variation during MR data acquisition, the computer program including a set of instructions that when executed by a processor causes the processor to:

partition k-space into a plurality of partitions wherein one partition corresponds to a center of k-space and the other partitions correspond to peripheral regions of k-space;

determine a distance from the center of k-space for each peripheral region; **and**

interleave sampling of the peripheral regions of k-space and samplings of the center region of k-space, wherein performing the interleaves sampling comprises:

sampling a first peripheral region of k-space at a pre-selected temporal rate;

waiting a first predetermined period of time before sampling the center region of k-space, the center region being sampled at a faster temporal rate than the first peripheral region;

sampling a second peripheral region of k-space at the pre-selected temporal rate; and

waiting a second predetermined period of time different than the first predetermined period of time before sampling the center region of k-space, the center region being sampled at a faster temporal rate than the second peripheral region;

wherein the first and second predetermined periods of time are a function of a distance of the respective first and second peripheral regions from the center region of k-space, wherein the predetermined amount of time increases as the peripheral region distance from the center increases.

Cancel Claims 3, 7, and 21 since they would be duplicates of features in their respective parent claim.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Angela M. Hoffa whose telephone number is 571-270-7408. The examiner can normally be reached on Monday - Friday, 10:00 am - 6:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. M. H./
Examiner, Art Unit 3768

/Long V Le/
Supervisory Patent Examiner, Art Unit 3768